HES E-toolkit user manual

HOTEL ENERGY SOLUTIONS

Energy Efficiency and Renewable Energy Applications in the Hotel Sector

Hotel Energy Solutions Official Partners

UNWTO

UNEP United Nations Environment Programme

ihra INTERNATIONAL HOTEL & RESTAURANT ASSOCIATION

ADEME French Environment & Energy Management Agency

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HOTEL ENERGY SOLUTIONS
E-TOOLKIT USER MANUAL

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Hotel Energy Solutions (HES) Project Basics
Full name: Excellence in Energy for the Tourism Industry – Accommodation sector: SME hotels (EETI)
Contract N°: IEE/07/468/S12.499390

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HES E-TOOLKIT USER'S MANUAL.

1.01 INTRODUCTION

In a world looking for new models of economic growth and development, fighting climate change and adopting sustainable management practices is no longer an option, but a condition for survival and success.

After three years of extensive research and testing, Hotel Energy Solutions (a UNWTO-initiated project made possible by the support of Intelligent Energy Europe, and implemented in close partnership with UNEP, IH&RA, EREC and ADEME) has developed its most important output: an innovative online application named Hotel Energy Solutions E-toolkit.

In response to the challenge of climate change, in line with the EU targets and the 2007 Davos process, the project's goal is to increase energy efficiency (EE) by 20% and the use of renewable energies (RE) by 10% in Small and Medium hotels (SMEs) across the EU, demonstrating that economic growth and the environment can, and should go hand in hand.

The easy-to-use toolkit requires answers to a short questionnaire, and consequently provides hoteliers with a report assessing their current energy use and recommendations on appropriate renewable energy and energy efficiency technologies. It further suggests what savings on operating expenses hotels can expect from green investments, through a Return on Investments Calculator.
The toolkit also includes a demo, for those who want to view an example before applying it to a real case scenario.

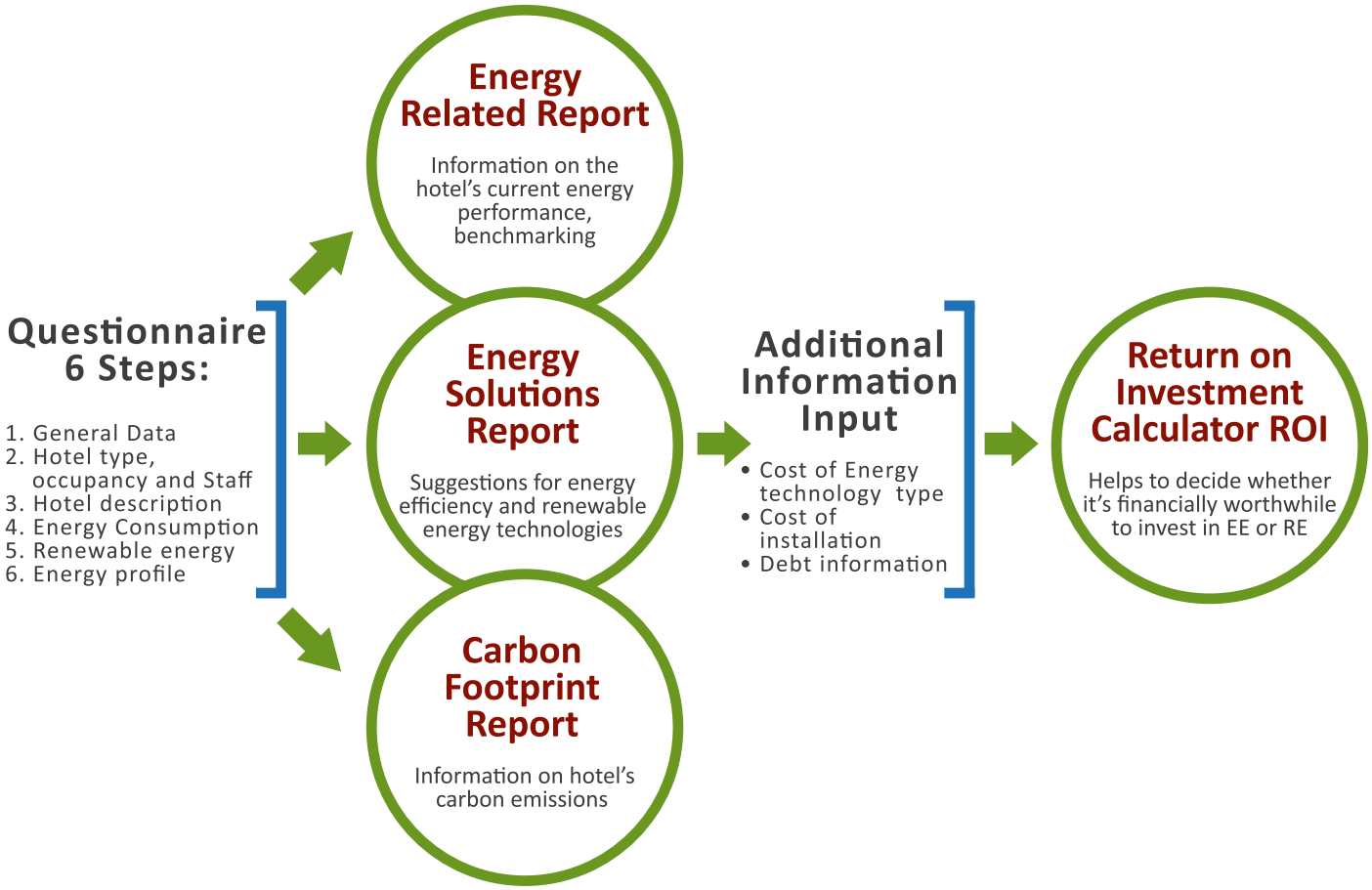
HES promotional video
http://vimeo.com/29472358

1.02 PURPOSE OF THE MANUAL

Hotel Energy Solutions can assist a wide range of decision makers including administrators, managers and staff, hotel associations, organisations that promote sustainable tourism, relevant educational programmes and other groups engaged within the hotel sector.
This user manual is aimed at assisting the public with the use of the e-toolkit, which will consequently enable the evaluation of opportunities for the application and establishment of EE and RE technologies and practices.

The manual is a step by step guide to the online toolkit procedure with illustrative screenshots for easy following.

Summary of the toolkit process and reports


Questionnaire 6 Steps:
1. General Data
2. Hotel type, occupancy and Staff
3. Hotel description
4. Energy Consumption
5. Renewable energy
6. Energy profile
Energy Related Report
Information on the hotel's current energy performance, benchmarking
Energy Solutions Report
Suggestions for energy efficiency and renewable energy technologies
Carbon Footprint Report
Information on hotel's carbon emissions
Additional Information Input
• Cost of Energy technology type
• Cost of installation
• Debt information
Return on Investment Calculator ROI
Helps to decide whether it's financially worthwhile to invest in EE or RE

1.03 LOGIN OR REGISTER

The web toolkit can be accessed at the following URL:

http://hes.unwto.org

Press "*It's free, get started"* to open a screen requesting login and password. First-time users must register in order to create an account. This is necessary to utilise the e-toolkit.

Once registered, you can enter login and password to connect to the e-toolkit. The platform will request verification of your account information.

Inside the e-toolkit platform, you will see a "+ project" option in the menu that allows you to create a new project. It is useful to note that you can have several properties stored simultaneously, with the information saved in your online account. To consult other projects, go to the "My projects" tab that is located on the main menu.

1.04 FILL IN THE QUESTIONNAIRE

To start working with the e-toolkit system, you will need to complete a questionnaire that gathers information about your hotel that is needed to evaluate a project. The questionnaire is divided in the following six steps (each explained separately in this section):

Step 1: General data

Step 2: Hotel type, occupancy and staff

Step 3: Hotel description

Step 4: Energy Consumption

Step 5: Renewable Energy

Step 6: Energy Profile

Step 1: General information: Give your project a title (1min.)

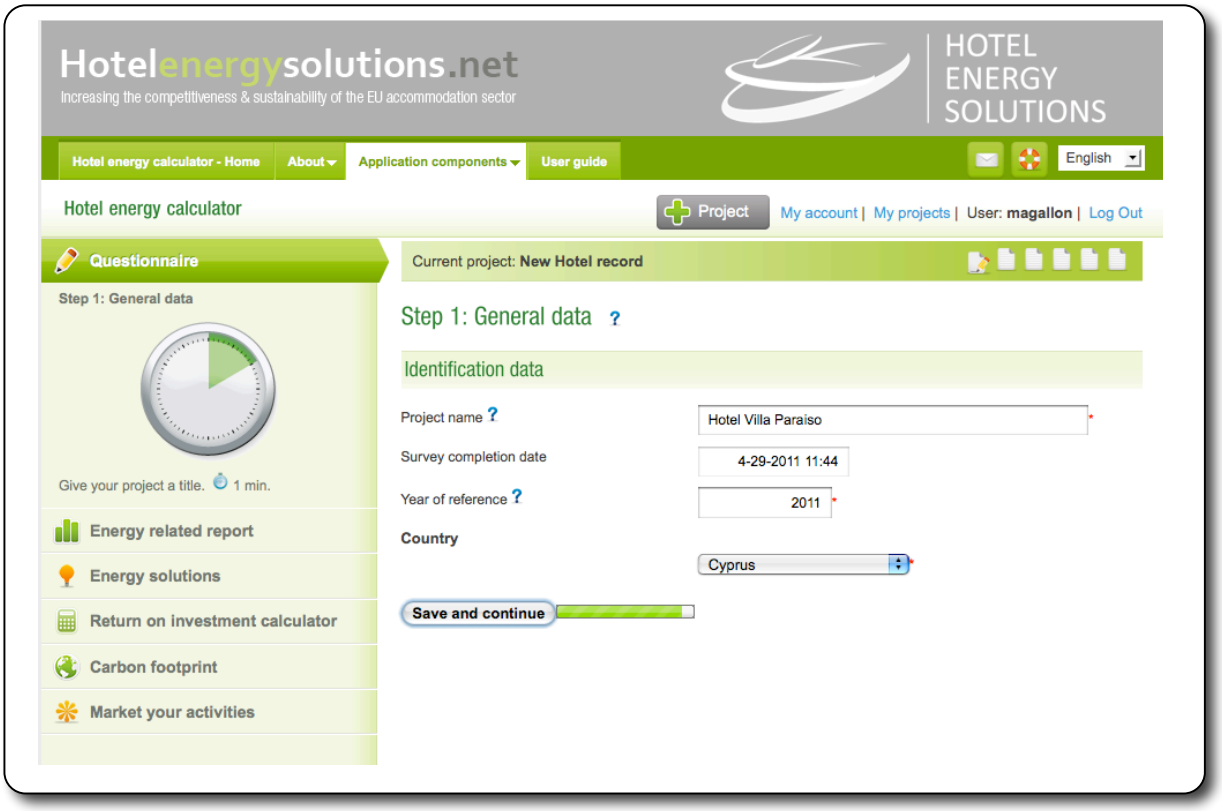
WHAT IS ASKED

- **Project name** (the name of your hotel)
- **Survey completion date** (automatic)
- **Year of reference** (the year you want to base the evaluation on)
- **Country** (the country where your hotel is located)

WHAT YOU NEED FOR THIS STEP

Know some general information about your hotel.

In this section, you will need to define the name of the project, the year of reference, and the country where the project is based. The system will automatically fill out the survey completion date. To continue to the next section and store the entered information, press the "Save and continue" button.



Step 2: Hotel type, occupancy & staff: Describe key elements influencing your energy needs (5 min.)

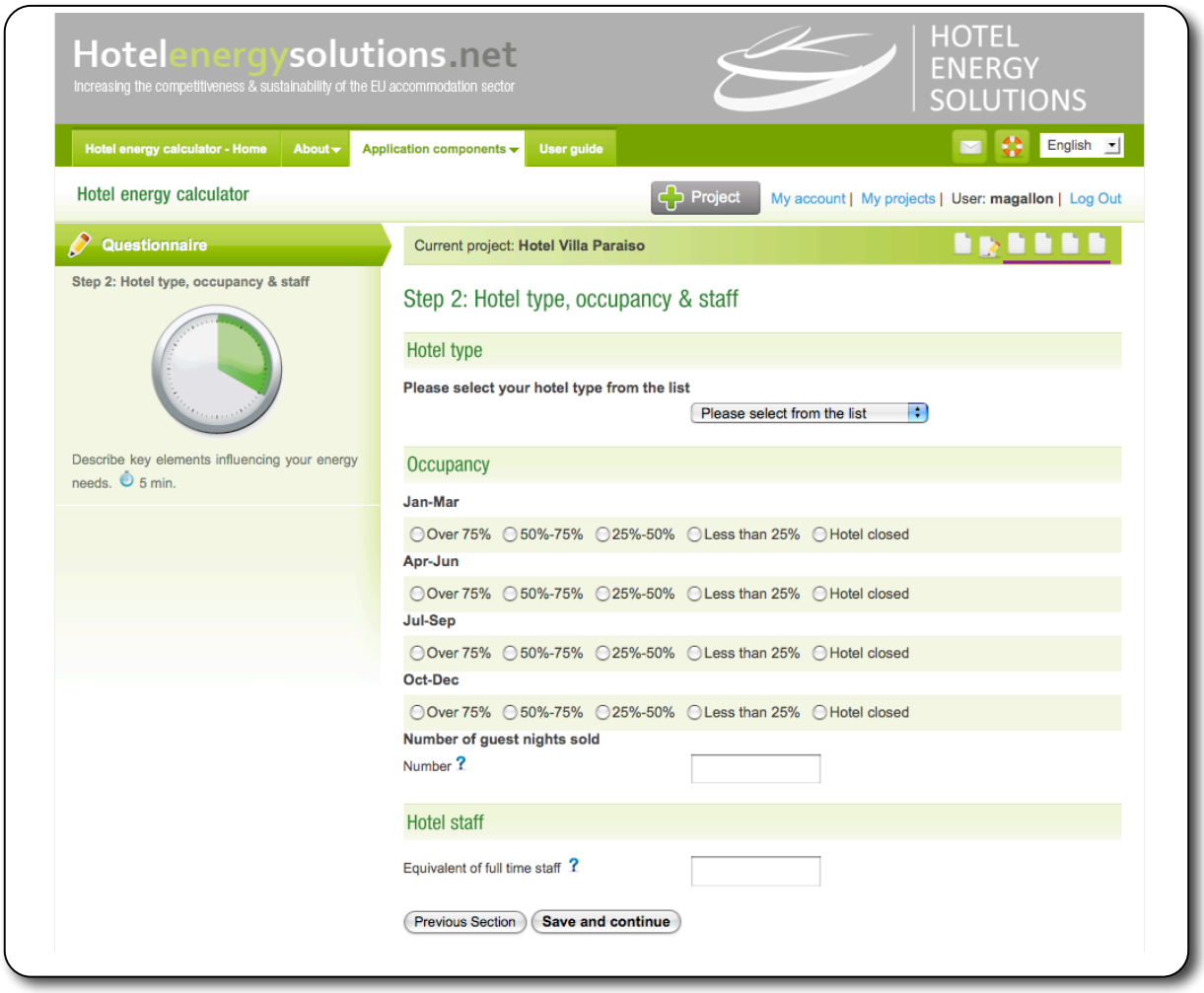
WHAT IS ASKED

- **Hotel type** (e.g. hostel, motel, resort hotel, inn etc.)
- **Average Occupancy** in a given period
- **Number of full time staff**

WHAT YOU NEED FOR THIS STEP

- **Consult your occupancy records**
- **Consult your employment records**

This section asks for information about your hotel, such as the hotel type (e.g. hostel, motel, resort hotel, inn, etc.), the average occupancy in a given period, the number of guest nights sold during the last year, and the number of full time staff in the same period.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Questionnaire
Step 2: Hotel type, occupancy & staff
Describe key elements influencing your energy needs. 5 min.
Current project: Hotel Villa Paraiso
Step 2: Hotel type, occupancy & staff
Hotel type
Please select your hotel type from the list
Please select from the list
Occupancy
Jan-Mar
Over 75% 50%-75% 25%-50% Less than 25% Hotel closed
Apr-Jun
Over 75% 50%-75% 25%-50% Less than 25% Hotel closed
Jul-Sep
Over 75% 50%-75% 25%-50% Less than 25% Hotel closed
Oct-Dec
Over 75% 50%-75% 25%-50% Less than 25% Hotel closed
Number of guest nights sold
Number
Hotel staff
Equivalent of full time staff
Previous Section
Save and continue

Step 3: Hotel Description: Gather information on your hotel building and geographical area to determine your energy needs and opportunities (5min.)

WHAT IS ASKED

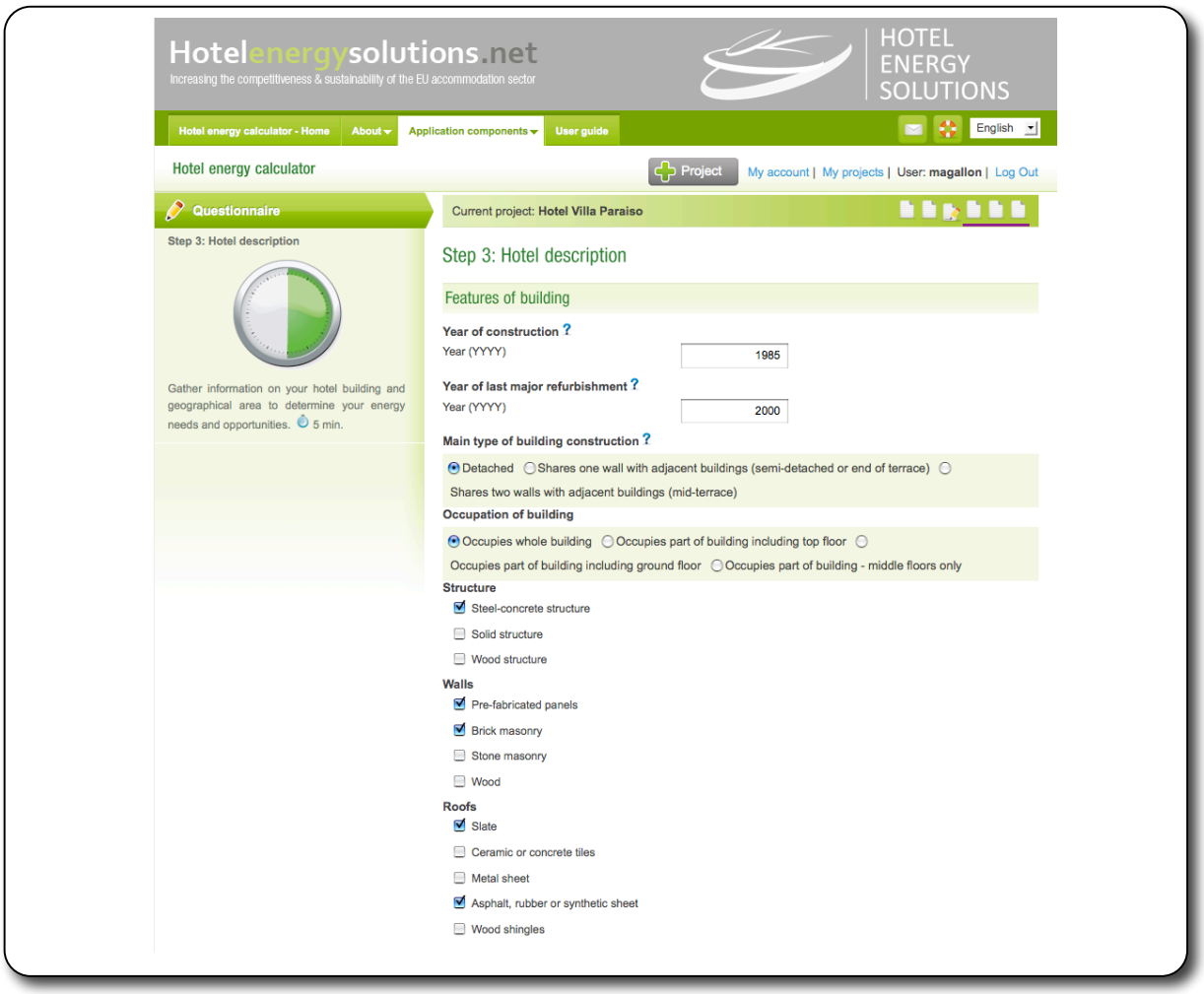
- **Features of the building**
- **Geographical area**
- **Climate conditions**
- **Hotel size and facilities**
- **Type of package offered**
- **Hotel star rating**
- **Other guest facilities**

WHAT YOU NEED FOR THIS STEP

- **Consult your architectural plans**
- **Carry out a visual inspection of your hotel**
- **Consult climate charts for your area**
- **Look for missing information on the Internet**

This section asks about:

- **Features of the building**, such as: year of construction, year of last major refurbishment, main type of building construction, current occupation of building, construction system of the building (structure, walls, and roof);
- **Geographical area:** whether the hotel is located in a coastal, mountain, rural, or urban area;
- **Climatic conditions:** approximate number of months in which outside temperature exceeds 30°C, and the approximate number of months in which outside temperature is below 10°C;
- **Hotel size and facilities** (total floor area, area of guest rooms, number of beds, etc);
- **Type of package offered:** whether the hotel offers full board, half board, self-catering, etc;
- **Hotel star rating** (5 stars, 4 stars, 3 stars, etc.);
- **Other guest facilities:** whether the hotel has a restaurant, lounge & bar, laundry, and so on;
- **Air conditioning:** whether the hotel uses an air conditioning system.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Questionnaire
Step 3: Hotel description
Gather information on your hotel building and geographical area to determine your energy needs and opportunities. 5 min.
Current project: Hotel Villa Paraiso
Step 3: Hotel description
Features of building
Year of construction ?
Year (YYYY) 1985
Year of last major refurbishment ?
Year (YYYY) 2000
Main type of building construction ?
Detached
Shares one wall with adjacent buildings (semi-detached or end of terrace)
Shares two walls with adjacent buildings (mid-terrace)
Occupation of building
Occupies whole building
Occupies part of building including top floor
Occupies part of building including ground floor
Occupies part of building - middle floors only
Structure
Steel-concrete structure
Solid structure
Wood structure
Walls
Pre-fabricated panels
Brick masonry
Stone masonry
Wood
Roofs
Slate
Ceramic or concrete tiles
Metal sheet
Asphalt, rubber or synthetic sheet
Wood shingles

Step 4: Energy consumption: Show all the energy sources you use currently (10min.)

WHAT IS ASKED

- **Type of energy used** (coal, LPG, natural gas, heavy oil, light wood chips or pellets etc.)
- **Type of use** (lighting, water heating, etc.)
- **Unit** (KWh,m^3,etc.)

WHAT YOU NEED FOR THIS STEP

- **12 months of all your energy bills**

This section gathers information on energy consumption by type of energy, such as:

-electricity (and its use – whether for lighting, water heating, etc.)

-coal

-district heating

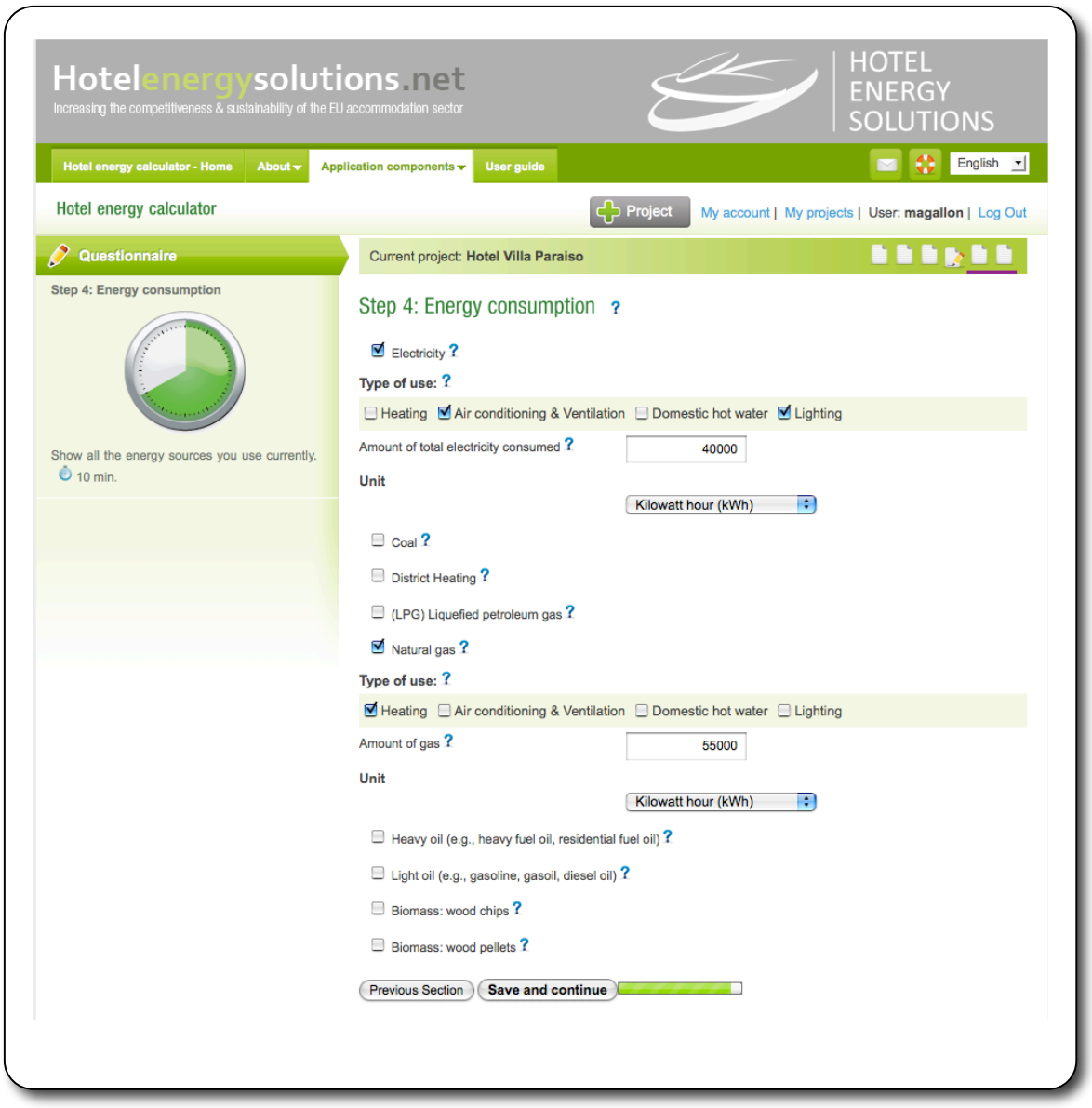
-liquefied petroleum gas

-natural gas

-heavy oil

-light wood chips or pellets.

For every option selected, the system displays additional questions on the amount of energy used, and the units used to measure that energy (e.g. KWh, m^3, etc.).



You can obtain information about the hotel's electricity consumption from your electricity bills. These show the consumption during certain periods of time (in KWh) – see chapter 4.4 of the training manual for more information on how to read your hotel's electricity bills.

To compile the information requested, you will need to have available electricity bills from the last 12 months, and sum the total electricity consumption for each period (normally in KWh). The total electricity consumption will be requested in the "Amount of total electricity consumed" box. The user will be requested to indicate the type of use of this electricity, e.g. it could be that the hotel has an air conditioning system that is powered with electricity, or that the heating system requires electricity to run. The same procedure has to be followed with the other energy sources or fuels.

WHAT IS ASKED

1. **Renewable energy technologies**

- Type of technology
- Installed capacity
- Amount of renewable energy generated
- Units used

2. **Natural resource potential e.g.:**

- Access to a river
- Water flow in the river
- Area to install a hot water tank
- Enough space to place a wind turbine

WHAT YOU NEED FOR THIS STEP

- **Gather information about existing renewable energy systems that the hotel has in place**
- **Obtain information from local authorities or regulatory entities (for river access and water flow)**
- **Carry out a visual analysis of surrounding area (e.g. identifying un-shaded areas (for solar panels) or areas un-blocked by trees/buildings/large equipment etc. (for wind turbines or solar panels).**
- **Consult hotel's architectural plans**
- **Measure the area of the available space (width, length and height).**

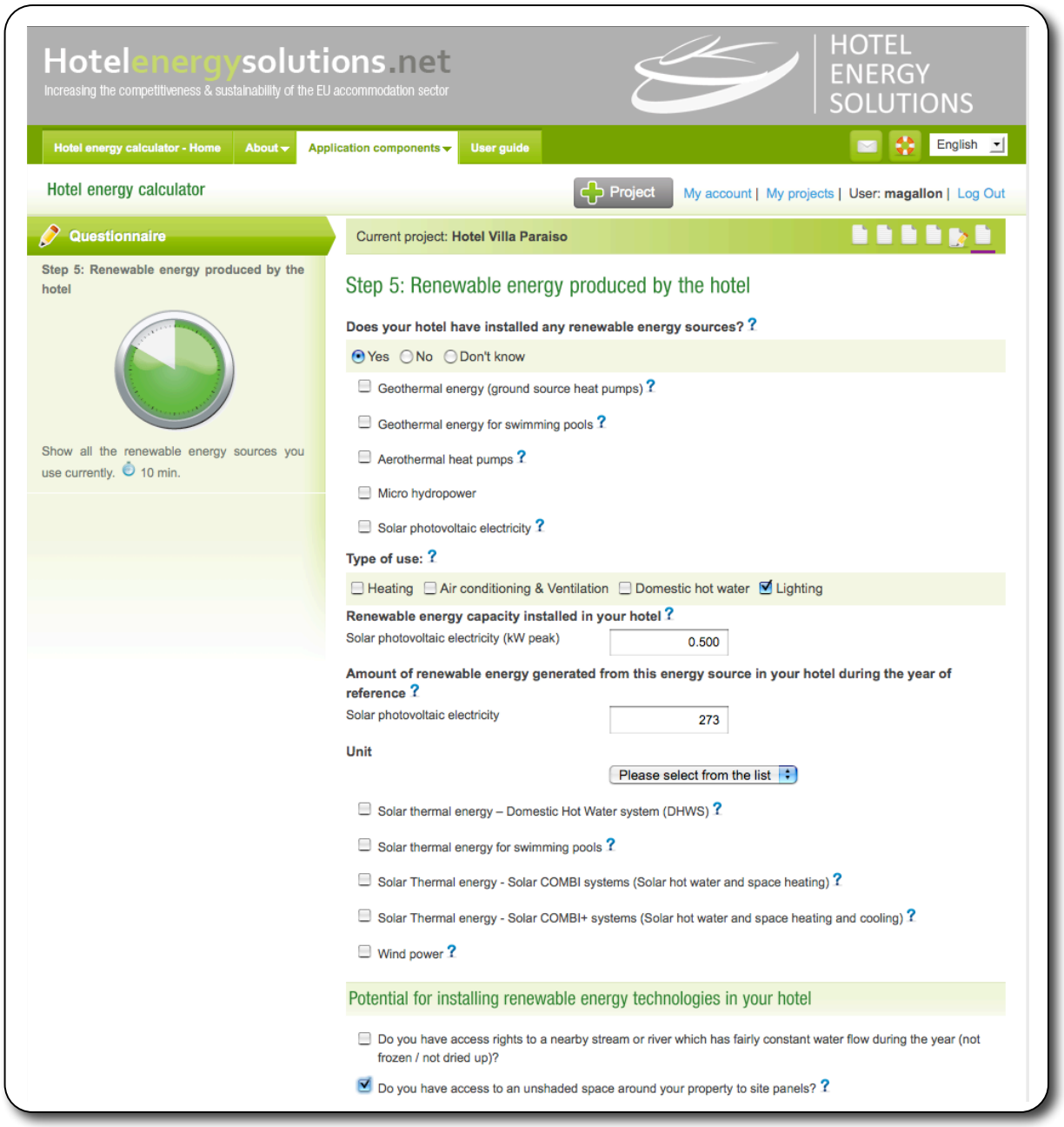
Step 5: Renewable Energy Use: show all the renewable energy sources you use currently (10 min.)

This section gathers information about existing renewable energy systems that the hotel has in place. The window is divided in two parts, the first being a list of different renewable energy technologies. If you select a technology, the system will ask questions regarding the installed capacity of the technology selected, the amount of renewable energy generated, and the units used (e.g. KWh). The second part aims to identify the natural resource potential and the space available at the hotel for installing new renewable energy technologies. These considerations include: access to a river, enough water flow in the river, enough area to install a hot water tank, and/or enough space to place a wind turbine.

If the hotel has surrounding ground area, you will be requested to specify the size of the area around the hotel.

The following table provides recommendations on where to obtain some of this information:

Access rights to a nearby stream or river	This information can normally be obtained from the local authorities or regulatory entity. Contact your local authorities to see what rules apply.
Water flow of the river	Local or state governments, or national entities, are normally in charge of monitoring river water levels and flows, and other characteristics of the river.
Un-shaded space on which to site solar panels	This information can be gathered with a simple visual analysis of the surrounding area of the facilities, identifying areas where sunlight is not blocked e.g. by trees, neighbouring buildings, large equipment and so on.
Unobstructed flow of wind to install a building-mounted wind turbine or a mast-mounted wind turbine	This information can be gathered through simple analysis of the surrounding area of the facilities, identifying e.g. neighbouring buildings, mountains, and large trees that obstruct wind flow.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Questionnaire
Step 5: Renewable energy produced by the hotel
Show all the renewable energy sources you use currently. 10 min.
Current project: Hotel Villa Paraiso
Step 5: Renewable energy produced by the hotel
Does your hotel have installed any renewable energy sources?
Yes No Don't know
Geothermal energy (ground source heat pumps)
Geothermal energy for swimming pools
Aerothermal heat pumps
Micro hydropower
Solar photovoltaic electricity
Type of use:
Heating Air conditioning & Ventilation Domestic hot water Lighting
Renewable energy capacity installed in your hotel
Solar photovoltaic electricity (kW peak) 0.500
Amount of renewable energy generated from this energy source in your hotel during the year of reference
Solar photovoltaic electricity 273
Unit
Please select from the list
Solar thermal energy – Domestic Hot Water system (DHWS)
Solar thermal energy for swimming pools
Solar Thermal energy - Solar COMBI systems (Solar hot water and space heating)
Solar Thermal energy - Solar COMBI+ systems (Solar hot water and space heating and cooling)
Wind power
Potential for installing renewable energy technologies in your hotel
Do you have access rights to a nearby stream or river which has fairly constant water flow during the year (not frozen / not dried up)?
Do you have access to an unshaded space around your property to site panels?

Information related to the area and space available inside the hotel may be obtained from the hotel's architectural plans. If you don't have these, you will need to measure the area of the available space (width, length and height).

Step 6. Energy Profile: Explain what energy efficient measure you have already undertaken (5 min.)

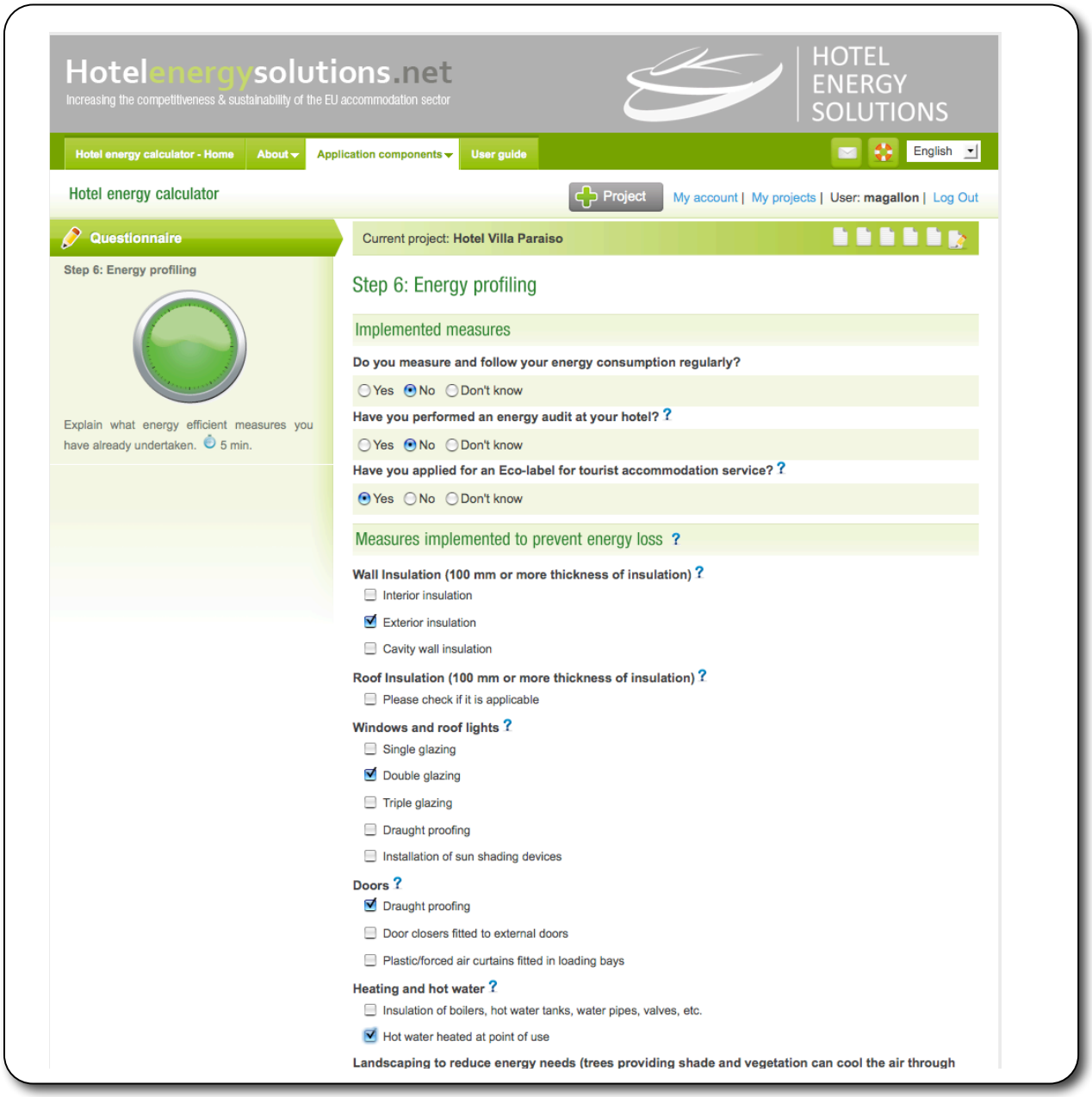
WHAT IS ASKED

- **Energy management measures that are already implemented in the hotel**
- Hotel's insulation
- Lighting system
- Energy efficiency equipment
- Heat production system
- Boiler
- Temperature controls
- Space cooling systems
- Information for guests and staff
- **Future plans** for major refurbishment

WHAT YOU NEED FOR THIS STEP

- **Gather information about the energy management measures that are already implemented in your hotel**
- **Carry out a visual inspection of the hotel,**
- **Review relevant files and archives related to implemented measures**
- **Look at equipment manufacturing manuals**
- **Collect missing information from the internet**
- **Contact the manufacturer**

This section will compile information about the energy management measures that are already implemented in your hotel, including relevant characteristics of your hotel's insulation, lighting system, energy efficiency equipment, heat production system, boiler, temperature controls, space cooling systems, information for guests and staff, and any future plans for major refurbishment.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Questionnaire
Step 6: Energy profiling
Explain what energy efficient measures you have already undertaken. 5 min.
Current project: Hotel Villa Paraiso
Step 6: Energy profiling
Implemented measures
Do you measure and follow your energy consumption regularly?
Yes No Don't know
Have you performed an energy audit at your hotel?
Yes No Don't know
Have you applied for an Eco-label for tourist accommodation service?
Yes No Don't know
Measures implemented to prevent energy loss
Wall Insulation (100 mm or more thickness of insulation)
Interior insulation
Exterior insulation
Cavity wall insulation
Roof Insulation (100 mm or more thickness of insulation)
Please check if it is applicable
Windows and roof lights
Single glazing
Double glazing
Triple glazing
Draught proofing
Installation of sun shading devices
Doors
Draught proofing
Door closers fitted to external doors
Plastic/forced air curtains fitted in loading bays
Heating and hot water
Insulation of boilers, hot water tanks, water pipes, valves, etc.
Hot water heated at point of use
Landscaping to reduce energy needs (trees providing shade and vegetation can cool the air through

This information can be obtained from a visual inspection of the hotel, by reviewing relevant files and archives related to implemented measures, or from equipment manufacturing manuals. (If you don't have the equipment manuals, you can usually obtain the same information from the Internet or by contacting the manufacturer.)

1.05 REPORTS AND SOLUTIONS

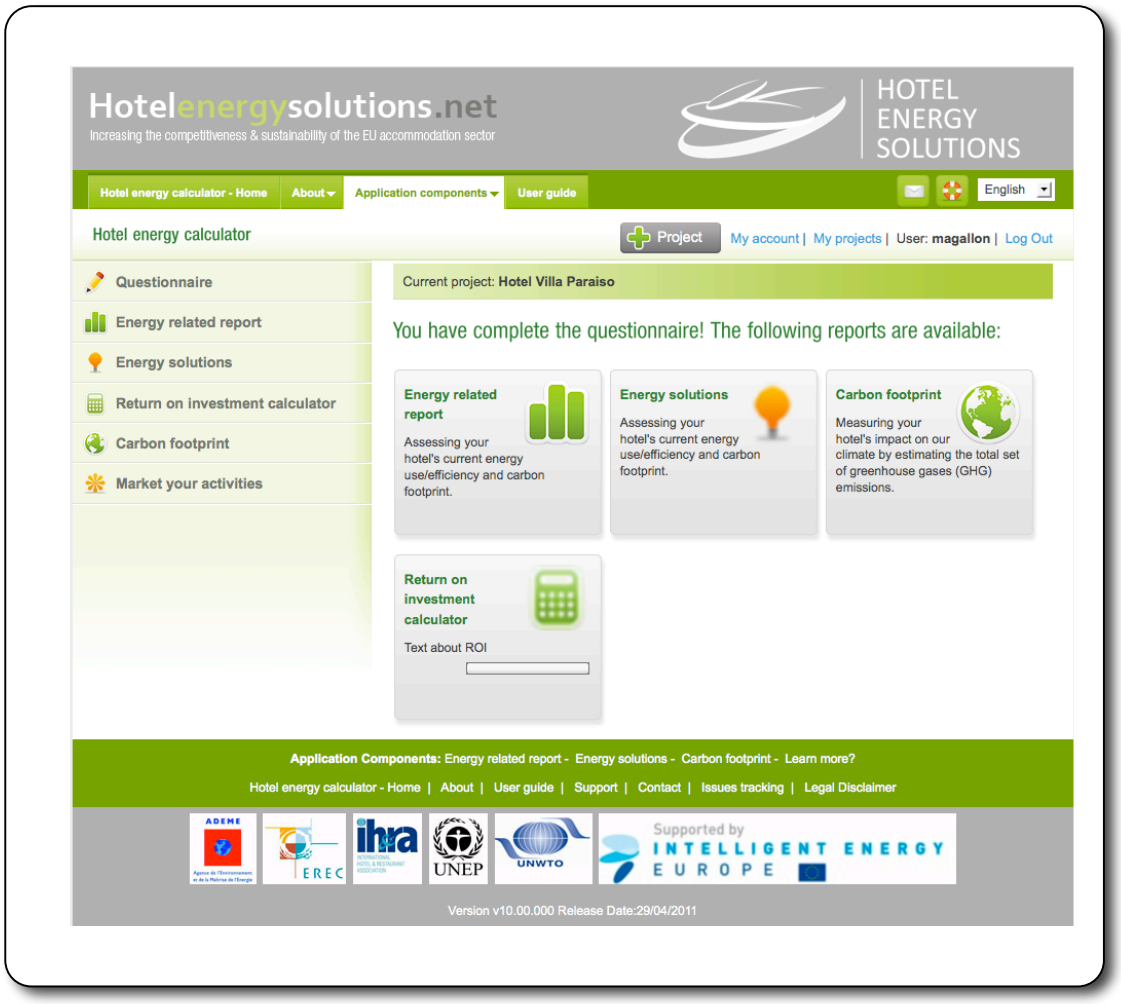
Once the questionnaire has been completed, the e-toolkit automatically performs calculations to produce four reports:

With a preliminary input in the questionnaire, you will be able to access:

1. Energy-related report
2. Energy solutions report
3. Carbon footprint Calculator

With additional input in the questionnaire you will be able to access:

4. Return on Investment Calculator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Questionnaire
Energy related report
Energy solutions
Return on investment calculator
Carbon footprint
Market your activities
Current project: Hotel Villa Paraiso
You have complete the questionnaire! The following reports are available:
Energy related report
Assessing your hotel's current energy use/efficiency and carbon footprint.
Energy solutions
Assessing your hotel's current energy use/efficiency and carbon footprint.
Carbon footprint
Measuring your hotel's impact on our climate by estimating the total set of greenhouse gases (GHG) emissions.
Return on investment calculator
Text about ROI
Application Components: Energy related report - Energy solutions - Carbon footprint - Learn more?
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Version v10.00.000 Release Date:29/04/2011

1. ENERGY RELATED REPORT

The energy-related report provides information on the hotel's current energy performance, and compares this with a predefined benchmark.

The HES benchmark has been set based on review and analysis of data available on energy use by hotels in Europe. This analysis indicates that for most hotels, energy use falls in the range 200-400 kWh/m2/yr. This is consistent with the main range of energy performance differentiation in published energy benchmarks (e.g. by Accor, Nordic Swan scheme, LowE project, WWF/IBLF, or the Thermie programme), which is also between 200-400 kWh/m^2/yr.

A statistical meta-analysis combining data from available studies indicates that average energy use by hotels is in the range of 305-330 kWh/m^2/yr. The data indicates large variations in energy use levels. Overall, it is evident that the variation between the hotels within each sample is far greater than the differences between the averages for different samples.

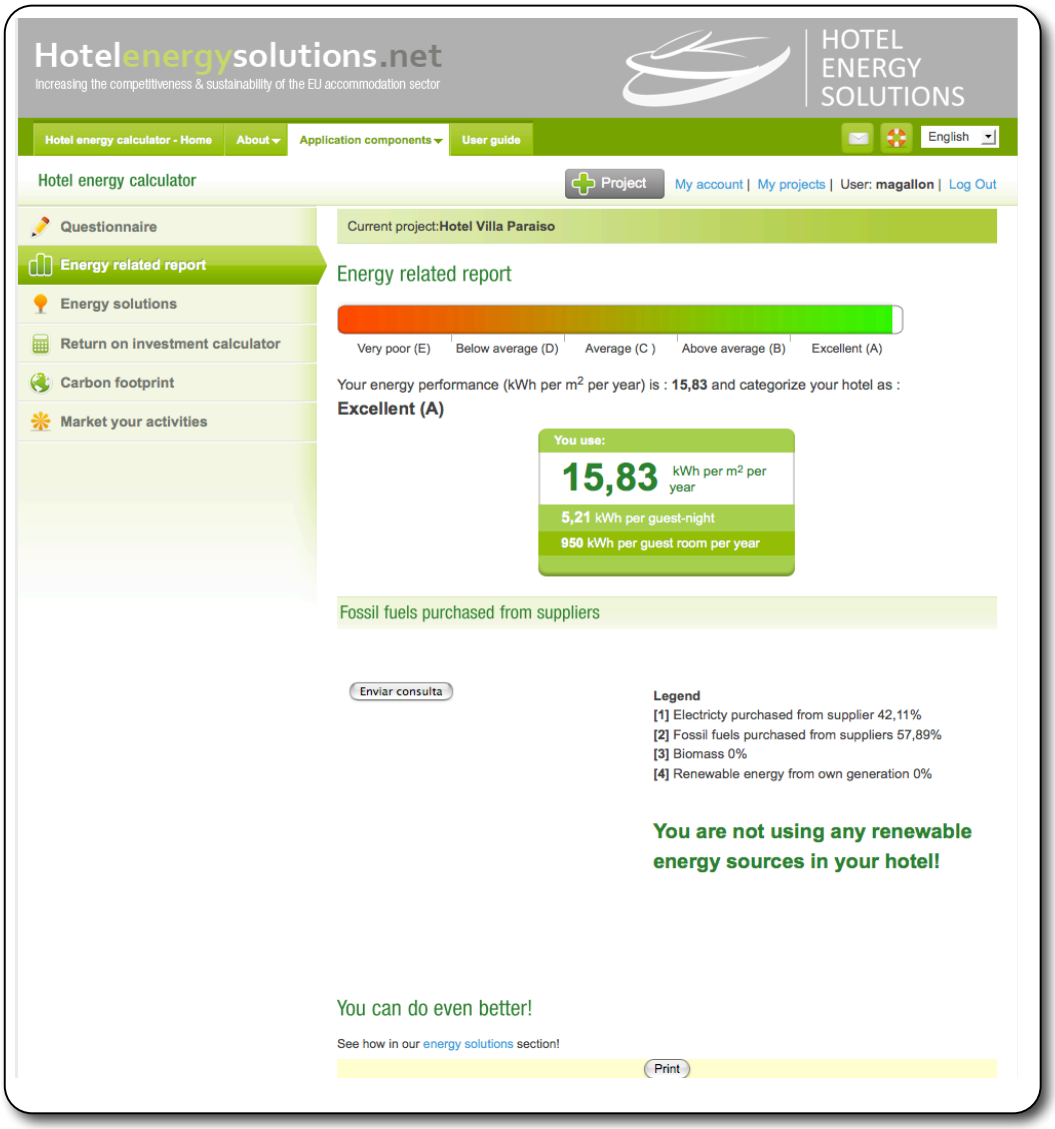
The analysis also indicates that kWh/m^2/yr is a more widely reported and useful comparative measure of energy use levels than kWh/guest-night, as the latter measure is susceptible to large variations due to changes in hotel occupancy levels in different years as well as variations in room sizes between different grades of hotel, although it is useful for managers when considering business performance. There was insufficient data to derive benchmark values for kWh/guest-night (and given the variations to which this measure is subject, benchmarks for this measure would be of limited comparative value in any case).

The HES benchmark has been set based on quintiles of the data from the meta-analysis referred to above, and are as follows:

	Range	kWh/m2/year	Quintiles
Excellent	< 195 kWh/m2/year	195	20%
Good	195 - 280 kWh/m2/year	280	40%
Average	280 - 355 kWh/m2/year	355	60%
Poor	355 - 450 kWh/m2/year	450	80%
Very poor	> 450 kWh/m2/year	>450	

The HES e-toolkit Energy Report shows and benchmarks energy use intensity (measured in kWh/m2/yr) for each hotel. It also shows, but does not benchmark, both kWh/guest-night and kWh/guestroom/year, as these are useful measures for managers when considering business performance.

Other points to note are that overall energy use levels can be relatively constant except in the most extreme climatic zones, since reduced need for heating is balanced by increased use of air conditioning. Although increases in energy for heating and less for cooling (and vice-versa) balance out over quite a wide climatic range, there will be significant differences in the necessary technologies to reduce energy use in different climatic zones.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Carbon footprint
Market your activities
Current project:Hotel Villa Paraiso
Energy related report
Very poor (E)
Below average (D)
Average (C)
Above average (B)
Excellent (A)
Your energy performance (kWh per m2 per year) is : 15,83 and categorize your hotel as :
Excellent (A)
You use:
15,83 kWh per m2 per year
5,21 kWh per guest-night
950 kWh per guest room per year
Fossil fuels purchased from suppliers
Enviar consulta
Legend
[1] Electricty purchased from supplier 42,11%
[2] Fossil fuels purchased from suppliers 57,89%
[3] Biomass 0%
[4] Renewable energy from own generation 0%
You are not using any renewable energy sources in your hotel!
You can do even better!
See how in our energy solutions section!
Print

The Energy related report provides a rating bar that indicates the evaluation of the hotel's energy performance (KWh per m2 per year). In this window, there is also a box with different energy performance metrics, including energy performance per m2 year, energy performance per guest night, and energy performance per guest room per year. These figures can be useful as the baseline to compare with future improvements in the hotel.

2. Energy Solutions Report: Proposed energy saving solutions for your hotel

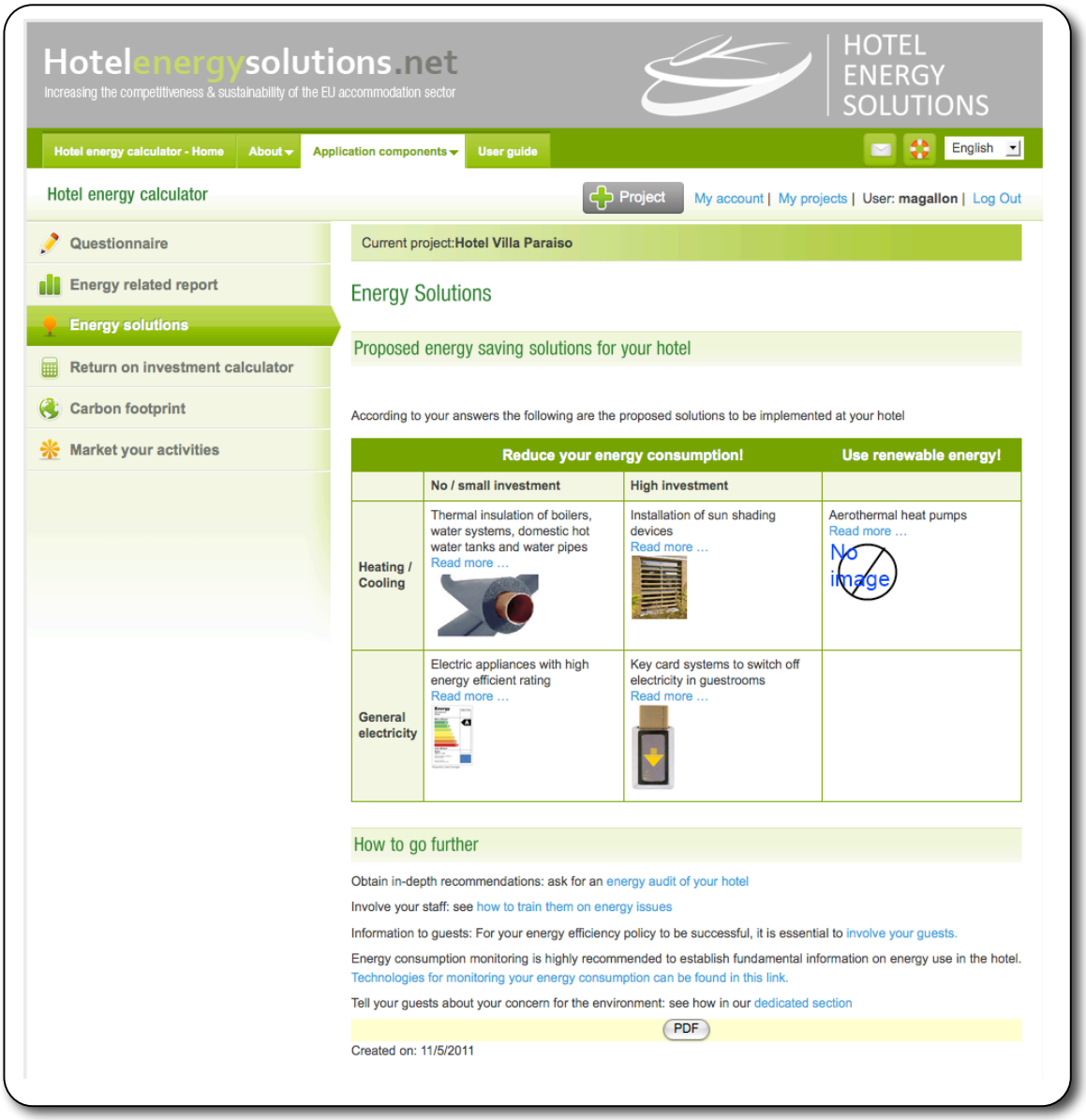
The purpose of the Energy Solutions Report is to provide suggestions for energy efficiency and renewable energy technologies that may be suited to the characteristics of your hotel, taking into account those technologies that the hotel is already using.

For example, the Energy Solutions Report takes into account the solar radiation at the geographical location of the hotel. The e-toolkit has information of the levels of solar radiation experienced in different EU countries, an important factor when providing recommendations on the use of solar renewable energy technologies. The system groups EU countries in three different categories according to whether they experience high, moderate, and low levels of solar radiation. These groupings are based on data for solar radiation mapped across Europe.

Table: data for solar radiation mapped across Europe.

Highest solar radiation	Moderate solar radiation	Lower solar radiation
Bulgaria	Austria	Belgium
Cyprus	France	Czech Republic
Greece	Hungary	Denmark
Italy	Slovakia	Estonia
Malta	Slovenia	Finland
Portugal		Germany
Romania		Ireland
Spain		Latvia
		Lithuania
		Luxembourg
		Netherlands
		Poland
		Sweden
		United Kingdom

Note: There are variations in solar radiation levels within countries, but these are only significant for France and Germany. However, in the e-toolkit system, it has not been possible to sub-divide these countries according to solar radiation levels.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HOTEL ENERGY SOLUTIONS
Hotel energy calculator - Home
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Project
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Questionnaire
Energy related report
Energy solutions
Return on investment calculator
Carbon footprint
Market your activities
Current project:Hotel Villa Paraiso
Energy Solutions
Proposed energy saving solutions for your hotel
According to your answers the following are the proposed solutions to be implemented at your hotel
Reduce your energy consumption!
Use renewable energy!
No / small investment
High investment
Heating / Cooling
Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes
Read more ...
Installation of sun shading devices
Read more ...
Aerothermal heat pumps
Read more ...
No image
General electricity
Electric appliances with high energy efficient rating
Read more ...
Key card systems to switch off electricity in guestrooms
Read more ...
How to go further
Obtain in-depth recommendations: ask for an energy audit of your hotel
Involve your staff: see how to train them on energy issues
Information to guests: For your energy efficiency policy to be successful, it is essential to involve your guests.
Energy consumption monitoring is highly recommended to establish fundamental information on energy use in the hotel. Technologies for monitoring your energy consumption can be found in this link.
Tell your guests about your concern for the environment: see how in our dedicated section
PDF
Created on: 11/5/2011

The report shows general recommendations for improvements in a table that classifies them according to whether they require no investments, small investment, or high investment. For every recommendation, there is a small description of the technology or improvement recommended.

The technologies* include:

Energy Efficiency

Energy consumption monitoring
Energy audit of the hotel
Audit for the European Eco-Label for tourist accommodation service
Staff training
Information to guests
Window insulation
Building Insulation
Prevention of air infiltration and of unnecessary outdoor air supply
Installation of sun protectors
Exterior work to improve summer comfort
Key card systems to switch off electricity in guest rooms
Lighting controls
Energy saving lightbulbs
Energy efficiency rating of electrical appliances
Motors with variable frequency controls in HVAC applications
Regulation of space heating and cooling
High efficiency boilers
Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes
Efficient solutions for active space cooling
Efficient ventilation systems (regulation & pre-heating)

Renewable Energy

Solar photovoltaic electricity systems
Solar thermal energy- Solar COMBI systems
Solar thermal Combi Plus Systems
Solar thermal- Domestic Hot Water systems
Solar heated swimming pools
Small wind energy systems
Biomass- Wood chips and wood pellets- heating systems
Combined Heat and Power (CHP)
Geothermal Energy
Geothermal Energy- Ground Source Heat Pumps
Biomass boilers
Geothermal heat pump (ground source heat pumps)
Micro-hydropower energy systems

Behavioural change

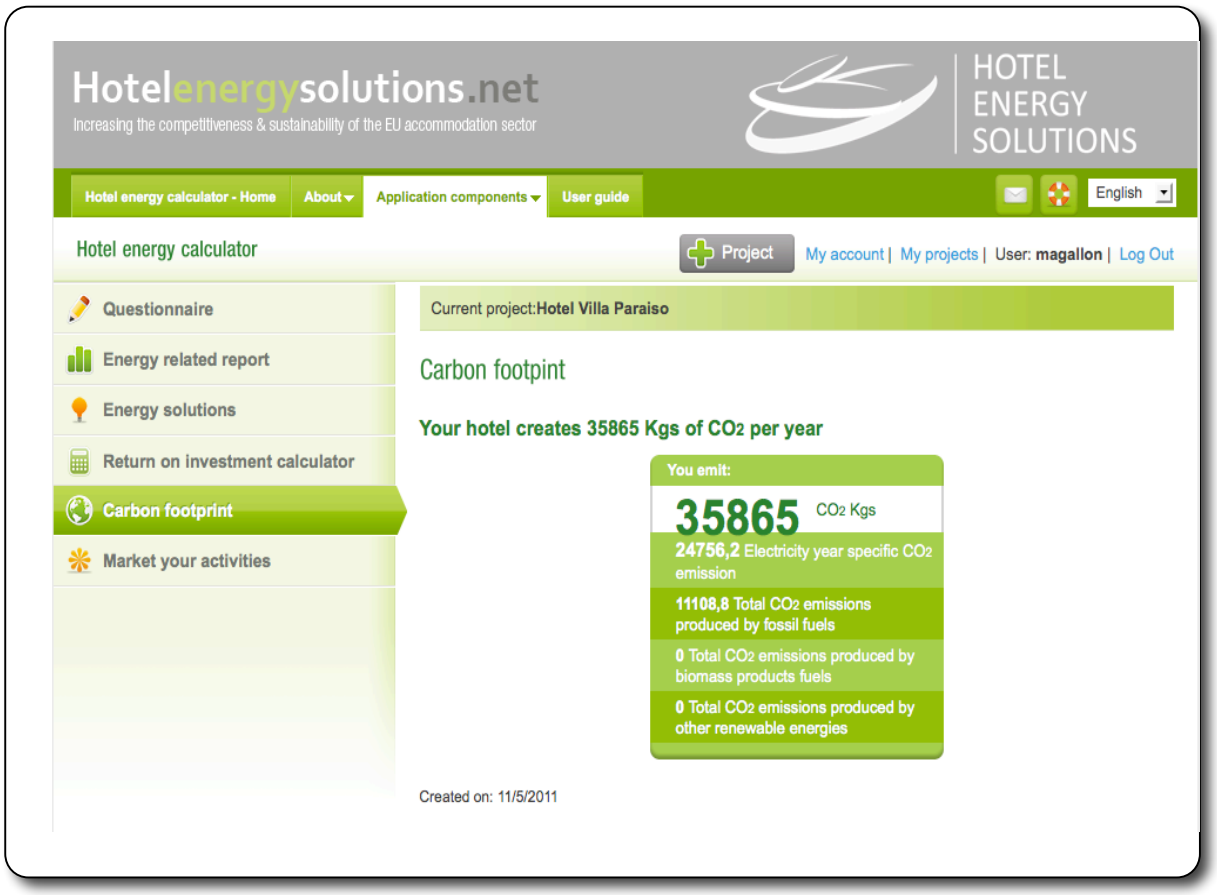
Staff engagement
Guest engagement

* all technologies individual factsheets can be accessed on
http://hes.unwto.org/en/content/energy-school-renewable-energy
http://hes.unwto.org/en/content/energy-school-energy-efficiency

3. CARBON FOOTPRINT REPORT

The objective of this report is to provide information on the carbon emissions that are associated with the hotel's electricity consumption, fossil fuels consumption, biomass consumption and renewable energy use.

The calculator uses the information provided in the questionnaire to perform these calculations. The carbon emissions are displayed in Kg of CO_2 on an annual basis.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Questionnaire
Energy related report
Energy solutions
Return on investment calculator
Carbon footprint
Market your activities
Current project:Hotel Villa Paraiso
Carbon footpint
Your hotel creates 35865 Kgs of CO2 per year
You emit:
35865 CO2 Kgs
24756,2 Electricity year specific CO2 emission
11108,8 Total CO2 emissions produced by fossil fuels
0 Total CO2 emissions produced by biomass products fuels
0 Total CO2 emissions produced by other renewable energies
Created on: 11/5/2011

It is important to note that the calculation of CO_2 emissions due to electricity consumption takes into consideration the national emissions per KWh of electricity produced. The CO_2/KWh rate can vary widely from country to country, and it is calculated according to the energy mix and fuel types that are used for generating electricity in that particular location.

The CO_2 emissions derived from fossil fuels are calculated from the information provided in the questionnaire on the amount of fuel used, and the type of fuel.

4. RETURN ON INVESTMENT CALCULATOR

The return on investment calculator helps the hotelier decide whether it is financially worthwhile to invest in an EE or RE technology project. The calculator will give you an estimate of different financial metrics.

To start working with the ROI calculator, select the option "Return on Investment Calculator" located on the left side of the menu screen. With a little additional information, it is possible to use this section of the tool.

DATA ENTRY SCREEN

The first window introduces information that will be needed to perform the calculations, and the questions are divided in three sections:

- Energy project type
- Debt information
- Financial information

Energy project type

This section displays a list of the EE and RE technologies that could be implemented in a hotel facility.

For every technology selected (by clicking on the corresponding box), the system will display the following six questions. Please note that not all of them are mandatory:

	Total Investment*	Investment that the technology will require. This value is NOT affected by the inflation rate.
*	Annual Maintenance and Operation cost (EUR/year)	This value will be applied during the whole cash flow period and it is affected by the inflation rate. There is no absolute standard as to which cost are included in Operation and Maintenance cost.
	Potential Annual Energy Savings (KWh/year)*	This information varies from country to country and from technology to technology.
	Feed in Tariff (EUR/KWh)	Other subsidy or incentives (EUR/KWh) Incentives that encourage the implementation of EE/RETs, If there is an energy price incentive.
	Predominant energy displaced*	Indicate the type of energy that it is displaced due to the EE/RET implemented. Select "1" for electricity and "2" for Thermal energy.

Mandatory information required to perform the calculations.

The user of the toolkit will need to do some research to find information on the cost of installation and technology on the internet, as it varies between countries/providers etc. The distributor, manufacturer or project developer can also help to provide this information.

Debt information

The second section requests information on any existing debt financing for the project, including:

Debt amount	Amount to be financed
Interest rate	Cost of the financing
Debt repayment period	Number of years to repay the debt

Please note that this information is not mandatory for performing the calculations.

If the information is left blank, the system will assume that there is no debt financing for the project (only equity from the hotelier).

Financial information

The third part of this section requests information needed to calculate the metrics.

Analysis Term (years)*	is the amount of time or the period that the analysis covers. The minimum value is 1 year and the maximum analysis period is 20 years. The entry has to be whole number, not years with decimals.
Discount rate*	Is the rate used for computing present values, which reflects the fact that the value of money depends on the time in which the cash flow occurs.
Inflation	The raise in price level expected. The inflation affects the energy savings (income) and the operational costs.
TAX Rate	The rate applied to taxable income
Depreciation Period (years)	The amount of time required for the original capital investment to be fully recovered. It is used for accounting purposes and Tax deductions. The entry could be between 0 (Zero) and 20 years. And it is calculated in a linear regression diminishing the value of the total investment by a fixed amount each year. It is assumed that the final value (salvage value) at the end of the depreciation period is zero.
Average Price of Electricity (EUR/KWh)* Average Price of Thermal energy (EUR/KWh)*	Information on electricity prices, and fuel prices can be obtain from the energy bills, or an estimate (for different countries in Europe) can be obtained in the next URL address http://www.energy.eu/

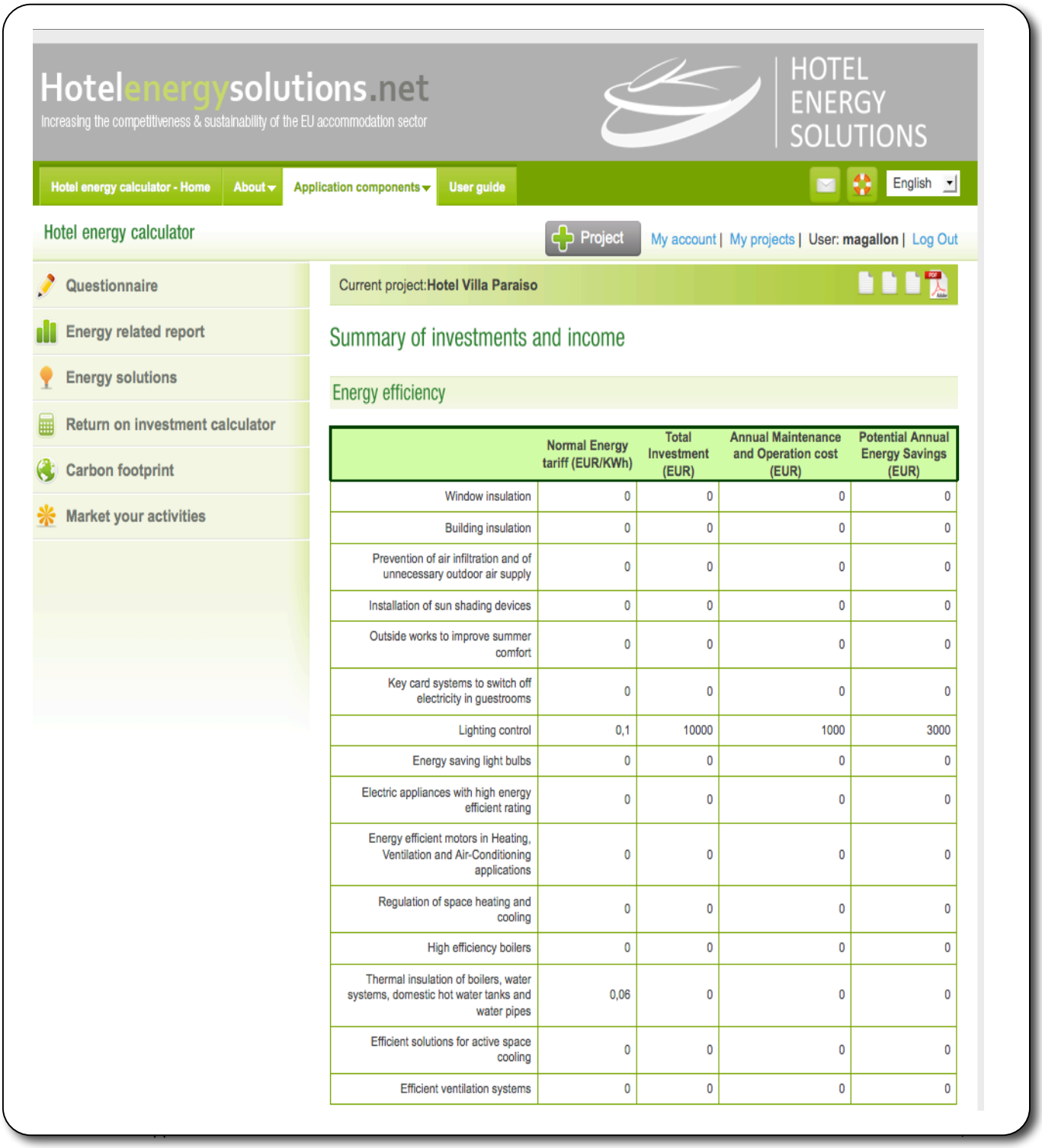
* *Mandatory information required to perform the calculations*

Once you have entered the information and pressed the “save and continue” button at the bottom of the window, the system will perform the calculations to evaluate the ROI metrics. Please note that given the amount of parameters taken into account in the calculation, it takes around 45 seconds to make the calculation and generate the reports.

Reports

By selecting the “Return on Investment Calculator” report you will be directed to the Energy Savings report window. In the upper right side of this window there are three icons. These icons represent the different ROI reports that the system generates, including:

- Energy savings
- Cash flow
- Return on Investment outputs



	Normal Energy tariff (EUR/KWh)	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Window insulation	0	0	0	0
Building insulation	0	0	0	0
Prevention of air infiltration and of unnecessary outdoor air supply	0	0	0	0
Installation of sun shading devices	0	0	0	0
Outside works to improve summer comfort	0	0	0	0
Key card systems to switch off electricity in guestrooms	0	0	0	0
Lighting control	0,1	10000	1000	3000
Energy saving light bulbs	0	0	0	0
Electric appliances with high energy efficient rating	0	0	0	0
Energy efficient motors in Heating, Ventilation and Air-Conditioning applications	0	0	0	0
Regulation of space heating and cooling	0	0	0	0
High efficiency boilers	0	0	0	0
Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes	0,06	0	0	0
Efficient solutions for active space cooling	0	0	0	0
Efficient ventilation systems	0	0	0	0

ENERGY SAVINGS REPORT

The Energy Savings Report is divided into three tables. The first four tables summarise the information that was introduced in the data entry section for each type of technology (one table each for energy efficiency, renewable energy or other investments). Each row contains information about the energy price, total investment, maintenance and operating cost, and potential annual energy savings associated with a specific technology option for your hotel.

The EE and RE investment tables are shown below:

Energy savings

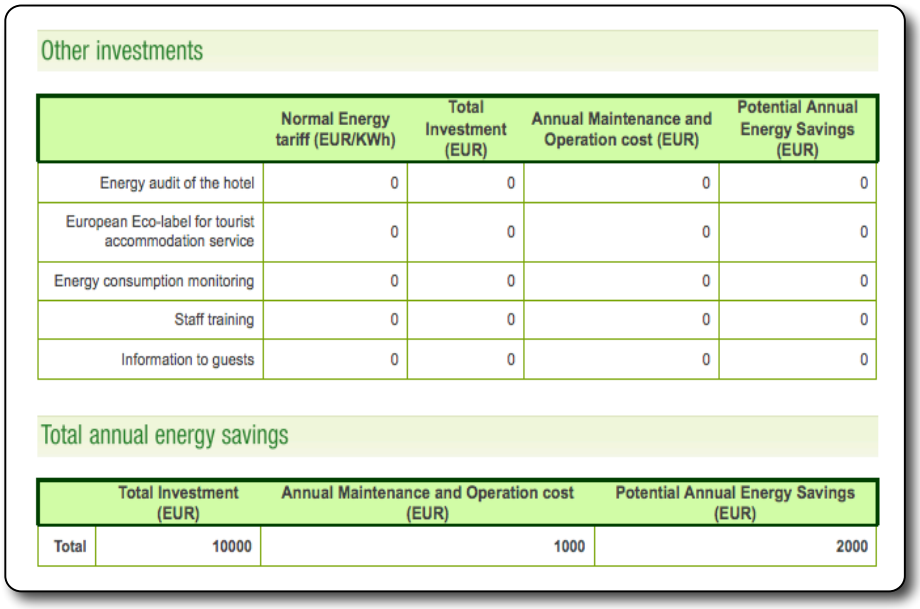
Energy efficiency

	Normal Energy tariff (EUR/KWh)	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Window insulation	0	0	0	0
Building insulation	0	0	0	0
Prevention of air infiltration and of unnecessary outdoor air supply	0	0	0	0
Installation of sun shading devices	0	0	0	0
Outside works to improve summer comfort	0	0	0	0
Key card systems to switch off electricity in guestrooms	0	0	0	0
Lighting control	0,1	10000	1000	2000
Energy saving light bulbs	0	0	0	0
Electric appliances with high energy efficient rating	0	0	0	0
Energy efficient motors in Heating, Ventilation and Air-Conditioning applications	0	0	0	0
Regulation of space heating and cooling	0	0	0	0
High efficiency boilers	0	0	0	0
Thermal insulation of boilers, water systems, domestic hot water tanks and water pipes	0,06	0	0	0
Efficient solutions for active space cooling	0	0	0	0
Efficient ventilation systems	0	0	0	0

Renewable energies

	Normal Energy tariff (EUR/KWh)	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Biomass	0	0	0	0
Geothermal energy for swimming pools	0	0	0	0
Aerothermal heat pumps	0	0	0	0
Geothermal energy (ground source heat pumps)	0	0	0	0
Solar Thermal energy - Solar COMBI systems	0	0	0	0
Solar Thermal energy - Solar COMBI+ systems	0	0	0	0
Solar thermal energy - Domestic Hot Water system (DHWS)	0	0	0	0
Solar Photovoltaic	0,1	0	0	0
Wind energy	0	0	0	0
Micro hydropower	0	0	0	0
Solar thermal energy for swimming pools	0	0	0	0

The ‘Other Investments’ is shown below:



Other investments

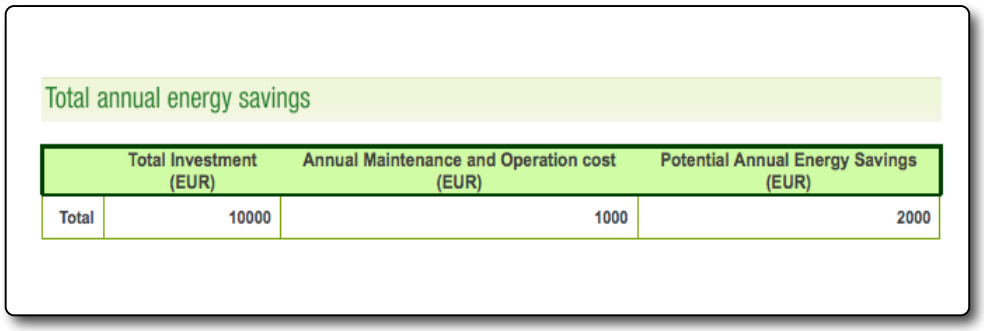
	Normal Energy tariff (EUR/KWh)	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Energy audit of the hotel	0	0	0	0
European Eco-label for tourist accommodation service	0	0	0	0
Energy consumption monitoring	0	0	0	0
Staff training	0	0	0	0
Information to guests	0	0	0	0

Total annual energy savings

	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Total	10000	1000	2000

The total “Potential Annual Energy savings” is estimated from different factors, such as amount of energy saved, price of energy, feed-in tariff (if any) and/or other incentives.

The fourth table adds together the total potential energy savings from the previous variables (total investment, annual operation cost, and potential energy savings)



Total annual energy savings

	Total Investment (EUR)	Annual Maintenance and Operation cost (EUR)	Potential Annual Energy Savings (EUR)
Total	10000	1000	2000

CASH FLOW

This report summarises information on the income, the breakdown of the costs, and the balance of each year of the analysis term of the project. The information is divided in two main sections: a summary table of the general project investment conditions, the cash flow.

The first table is a summary of the project general conditions. The second table, "Cashflow of the complete project, is divided in two sections. The first section shows the investments (at the beginning of the project):

Cashflow of the complete project - unleveraged

Cash flow from investment

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
(-) Total Investment	-10000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal (1)	-10000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Cash flow

Year reference	10
Total Investment	10000
Discount rate	0,08
Debt	20000
Interest rate - cost of debt	0,08
Debt repayment period	5
Inflation	0,02
TAX	0,3

The second section shows the energy savings (revenues) and the breakdown of costs (maintenance and operation costs, depreciation, interest, etc.) for each year:

Cash flow from Operation

Year	0	1	2	3	4	5	6	7
(+) Energy Savings (Revenues)	0	2040	2080,8	2122,42	2164,86	2208,16	2252,32	2297
(-) Maintenance and Operation cost	0	-1020	-1040,4	-1061,21	-1082,43	-1104,08	-1126,16	-1148
(-) Depreciation	0	2000	2000	2000	2000	2000	0	
(-) Interest	0	-1600	-1327,27	-1032,72	-714,61	-371,05	0	
Total income before taxes	0	-2580	-2286,87	-1971,51	-1632,18	-1266,97	1126,16	1148
(-) Tax	0	0	0	0	0	0	0	
(+) Depreciation	0	2000	2000	2000	2000	2000	0	
(-) Principal	0	-3409,13	-3681,86	-3976,41	-4294,52	-4638,08	0	
Net income after taxes	-10000	-3989,13	-3968,73	-3947,92	-3926,7	-3905,05	1126,16	1148
Present value	-10000	-3693,64	-3402,55	-3133,99	-2886,24	-2657,71	709,67	670
Net present value	-10000	-13693,64	-17096,19	-20230,18	-23116,42	-25774,13	-25064,46	-24394
IRR								
Discounted payback								

The amortization debt line shows an estimate of the gradual elimination of the debt in regular payments over a specified period of time. Such payments must be sufficient to cover both principal and interest.

The depreciation line shows how the technology assets lose its value over time (in other words, they depreciate). The tool calculates the depreciation in equal instalments until the book value of the asset is reduced to zero.

The second section also shows the balances for each year (net income after taxes). These values are then discounted to obtain their present value (PV).

The NPV is the sum of the PV of a selected year plus the PV of all previous years. For example, the NPV of year 3 is the sum of the $PV_{year\ 3} + PV_{year\ 2} + PV_{year\ 1} + PV_{year\ 0}$):

$$NPV_{year\ 3} = -3133.99 -3402.55 -3693.64 -10000$$

$$NPV_{year\ 3} = -20230.18$$

The Internal Rate of Return (IRR) calculation is a unique value for the entire project, and it is displayed in the last year of the project's analysis term. For example, if the project term is 10 years, the IRR will be shown in the column of year 10.

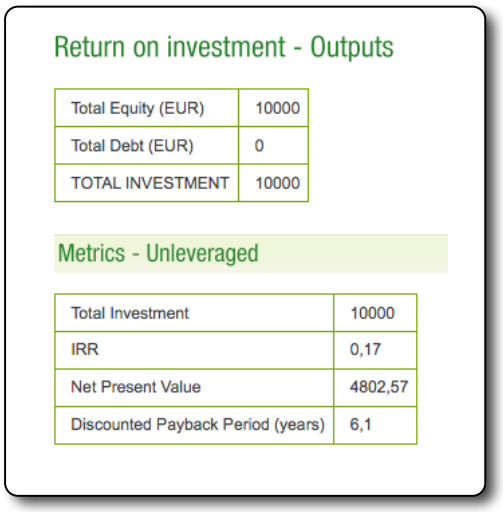
The higher a project's internal rate of return, the more desirable it is to undertake the project. An investment is financially viable if the IRR exceeds the required "discount rate". Otherwise, the investment should not be made.

The discounted Payback Period is the period of time required for the return on an investment to "repay" the sum of the original investment, and the value will be displayed in the column of the year that matches the result of this calculation.

Note: you can find more information about how to calculate the IRR, NPV and Discounted Payback period in Annex 8 of this training manual.

RETURN ON INVESTMENT OUTPUTS

This report summarises all the metrics that were calculated to evaluate the project investment. The report has three tables. The first table displays information on how the investment has been financed (including debt and equity portion), the second table displays the metrics (IRR, Net Present Value and Payback Pack period in years), and the third table shows the same values in a leveraged scenario.



Return on investment - Outputs

Total Equity (EUR)	10000
Total Debt (EUR)	0
TOTAL INVESTMENT	10000

Metrics - Unleveraged

Total Investment	10000
IRR	0,17
Net Present Value	4802,57
Discounted Payback Period (years)	6,1

IRR – Internal Rate of Return:

The higher a project's internal rate of return, the more desirable it is to undertake the project. An investment is viable if the IRR exceeds the required “discount rate” and should be rejected otherwise.

NPV – Net Present Value:

Projects with a positive NPV represent net savings for the hotel. Projects associated with an NPV of zero will recuperate only the cost of the capital required to make the investment. Projects with a negative NPV represent a financial loss for the hotel.

Discounted Payback Period:

This is the period of time required for the return on an investment to "repay" the sum of the original investment. A short payback period is desirable, because the sooner the cash is recovered, the sooner it becomes available for reinvestment in other projects.

Please note: in order for an investment to be attractive, the NPV must be bigger than zero, and the IRR must be bigger than the discount rate. When you have two project options with similar NPV or IRR, it is better to choose the project that has the shorter payback period.

LEARN MORE: ADDITIONAL PUBLICATIONS AND COMMUNICATION MATERIALS

In addition to the e-toolkit, the HES has a series of publications and communication materials which can provide practical and cost effective ways for SMEs to improve their energy efficiency as well as implementing renewable energy solutions in an easy to use format for non-experts. These help users gain a deeper knowledge about the range of choices available to them. An „Energy School“ section on the HES website explains the steps and „educates users“ to reach a successful environmental policy in their hotels, with tips such a sensitizing guests and staff.

All the information contained in the aforementioned publications has been used to build the HES e-Toolkit.

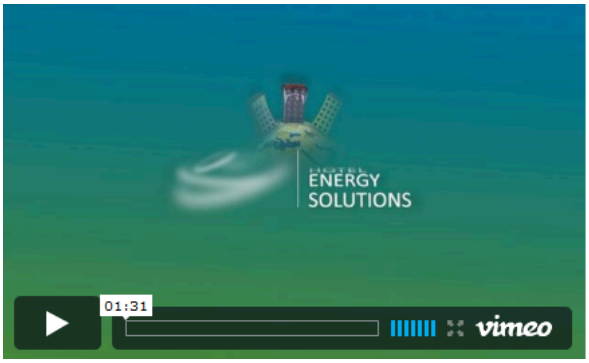
1.06 COMMUNICATION MATERIALS: HES VIDEO AND BROCHURE

The HES Video and Brochure can help you sensitize your guests on energy savings and encourage them to take an active role, by providing them with useful tips and ideas which they can apply during their stay, as well as at home.

We authorize the use of these materials free-of-charge to support hoteliers.

E-BROCHURE

http://hes.unwto.org/en/content/communication-tools-sensitizing-your-guests



HES 3D VIDEO

http://vimeo.com/29033687

PUBLICATIONS

ENERGY EFFICIENCY SERIES

[Best Practices Guide - Successful EET Integration in SME Hotels.]
[Factors and Initiatives affecting Energy Efficiency use in the Hotel Industry.]
[Key Energy Efficiency Solutions for SME Hotels.]
[Key Energy Efficiency Technologies Database for SME Hotels.]

RENEWABLE ENERGY SERIES

[Best Practices Guide – Successful Renewable Energy Technologies integration in SME Hotels.]
[Key Renewable Energy (RE) Solutions for SME Hotels.]

RESEARCH SERIES

[Analysis on energy use by European hotels: online survey and desk research]

TRAINING MANUAL 2011

Energy Efficiency and Renewable Energy Applications in the Hotel Sector: TRAINING MANUAL

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